



## Digital Maintenance within Digital Twin Development



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Digital maintenance, at its core, involves harnessing digital technologies such as sensors, data analytics, and artificial intelligence to optimize the performance of physical assets. However, its scope transcends this initial impression. To fully grasp its importance, it is crucial to consider both the aspect of maintenance management, which faces significant challenges in effective data utilization and process evolution, and the design and management of maintenance services, which directly connects to the value and business of the organization. This perspective allows companies to deploy maintenance functions that are constantly evolving, becoming increasingly proactive and essential for Servitization approaches.

Ultimately, digital maintenance and asset management are intrinsically linked to the need to redefine assets in the context of dual duality: their physical-digital nature and their role as products or services. This paradigm shift is essential to address present and future challenges of digitization, as well as to fully leverage the potential of emerging technologies in operational optimization and business value creation. Introducing a new approach to defining assets could be key to overcoming current limitations and laying the groundwork for more robust management models.



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While this challenge is not exclusive to maintenance, this field is fundamental to its development, as many of the technologies involved find their primary and immediate application here. Notable examples include IoT technologies for monitoring, artificial intelligence for fault prediction, and BIM models applied to operations and maintenance management of systems.

The definition of what a digital twin is triggers an ongoing stimulating academic reflection. However, from a practical perspective, it is crucial to ask why companies demand digital twins and what underlying need drives this demand. From the maintenance perspective, the answer may lie in the need to consolidate data and models scattered across various applications and systems, providing a unique and comprehensive view of the digital part of assets. In this sense, the digital twin emerges as a tool of great value to control and manage assets proactively and efficiently, facilitating informed decision-making and optimizing short- and long-term asset and system performance.



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In this context, the need for methodology generation and standardization becomes pressing. Examples like the Asset Administration Shell (AAS) underscore the importance of establishing standards that facilitate interoperability and system integration, thus promoting efficiency and coherence in digital asset management. Furthermore, the orientation towards servitization implies the design of complex systems focused on customer requirements. Model-Based Systems Engineering (MBSE) emerges as a key methodology in this regard, enabling the creation and management of integrated models spanning from customer requirements to system implementation, ensuring alignment between customer expectations and system capabilities.

From this perspective, it may be more appropriate to refer to the application of digital twin technologies (DTT) to maintenance, highlighting the fundamental importance that maintenance has in generating experiences and use cases, many of them linked to the use of prognosis models based on AI for predictive and prescriptive maintenance. Additionally, they provide an optimal environment to propose and validate innovations in DTT development, while promoting the dissemination and growth in maturity of organizations and their members in the face of this new technological landscape.

Precisely we will share knowledge and experience regarding these topics in the last week of May in Bilbao (Spain) in an event organized by ESReDA, Universidad de Deusto jointly with the European projects [ENHANCE](#) and [BUILDCHAIN](#), and with the support of [DESUTOTECH](#) and [CEN SOLUTIONS](#). This event will encompass the **64<sup>th</sup> ESReDA Seminar** with a parallel **Doctoral School of Digital Twinning**.

The doctoral workshop covering the following topics:

- Introduction to Digital Twinning
- Introduction to Inverse Problems and their Probabilistic Treatment
- Bayesian model updating and filtering and computational techniques
- Predictive/proxi modeling, explainability of models
- Modeling using stochastic polynomials
- BIM technologies and digital twinning
- Educative examples of the whole framework, summary

You are all invited. Registration to attend both activities are still open:

- [64<sup>th</sup> ESReDA Seminar](#) May 30<sup>th</sup>- 31<sup>st</sup>
- [Digital Twin Doctoral Workshop](#) May 29<sup>th</sup>- 31<sup>st</sup>

Nos vemos en Bilbao!!!

## Is resilience a sustainable trend? Milestones towards collective resilience.



*Jean-François Raffoux*  
ESReDA  
Honorary President

*By Jean-François RAFFOUX and Yves MERIAN – IMdR, France*

For the past twenty years, the notion of resilience in the approach to risks has aroused a real craze and almost a trend. This approach, which now goes hand in hand with the culture of risk, reflects our society's awareness that risk management wants to go further than the prevention-repair approach, in the face of the hazards or disruptions we are facing today (climate change, technology development, globalization, geopolitics, ...) . Resilience reflects our need for anticipation to enable our society to face these hazards in order to continue its activities and adapt to them.

This notion of resilience, however, raises questions that the French Institute for Risk Mastering (IMdR) and the French Association for Natural and Technological Risk Reduction (AFPCNT) wanted to address in two seminars held in 2023 to better understand and implement it. These seminars brought together risk professionals and various stakeholders involved. At the same time, a citizens' survey was launched. The following is a summary of the debates and opinions collected.

### **Understanding and consolidating the concept of resilience**

The definition of resilience has been clarified by many authoritative sources (ISO, UN, in France the White Paper on Defence and National Security,). These definitions are quite convergent but still need to be stabilized on several points. Some risk professionals tend to think of resilience as a substitute for prevention, whereas these two concepts should remain complementary. To reach common sense resilience integrates prevention. The purpose of resilience also deserves to be clarified insofar as it does not only concern the entity affected by the hazard, to ensure its survival and the maintenance of its objectives, but also the targets related to it : population, partners, ecosystem,...

### **Build and implement this process**

Unlike the resilience of a material, which is an intrinsic property of the material, the resilience of a techno-economic system is a process that is built and accessible to all entities concerned.

Resilience is a multi-risk process (technological, natural, human, socio-economic,), multi-stakeholder (companies, citizens, local authorities, State, academic institutions, financial institutions), multi-disciplinary (operational safety, crisis management, organizational and human factors), multifactorial (mobilizing technical, human and social sciences, economics,) The implementation of this process requires a cross-cutting approach leading the various stakeholders to "get out of their silos", to enter into coordination mechanisms, to be part of the long term and to develop real learning through appropriate training. These training courses must be based on a multifaceted pedagogy that gives a large part to exercises, guides explaining the methods of approach and addressing various types of population and offering basic training for young people.

The methodologies to be implemented are essential; In particular, the industrial experience (in particular that of large groups and network operators) can be disseminated. These methodologies must also be adapted to the different profiles of actors (from the most structured to the most neophytes) by using powerful scientific tools developed and implemented by professionals, but also simple tools adapted to neophyte actors or actors with limited resources (SMEs).

## A framework and societal governance to be developed

In addition to the legislative tools used with regard to operators of vital installations or critical infrastructures and European directives, it is important to develop groupings that make it possible to pool resources, particularly at the level of inter-municipalities but also SMEs and organisations with limited resources in order to familiarise them with these practices.

A national resilience strategy was adopted in April 2022 and national mechanisms and bodies were put in place to involve the various ministries concerned, coordinated by the Prime Minister's office. This strategy also involves businesses, local authorities, and the population.

Resilience is "everybody's business" and needs to be supported by risk professions. Thus, local implementations have been launched, in particular at the level of local authorities, but the question of the interest of a formalized resilience function in an "ad hoc" structure remains under debate.

The first implementations of this strategy have made it possible to discern three fundamental areas to be developed:

1. Evaluation: To which actors does it apply? Is it possible to measure a level of resilience? What are the adequate tools to use?
2. Knowledge of the costs to be borne in order to maintain a resilience system; these costs are often misunderstood, and it would be important to identify them in a "Cost/Benefit" approach to measure the effectiveness of the system and thus mobilize appropriate funding.
3. Regulation

The implementation of a resilience process that has a strong socio-economic impact requires monitoring and regulation regarding:

1. The population that can exert influence as a user of services rendered, a victim of adverse effects or stakeholders of the entities concerned; Trust between actors contributes to building collective resilience
2. Professionals who must participate in the overall evolution of their sector with a constant trade-off between the principle of prudence (which consists in managing a priori by preventively improving the entities they control) and the principle of reparation (which consists in managing a posteriori by eliminating harmful effects that could not be avoided.)
3. The authorities who must develop regulatory, normative, fiscal or financial mechanisms to guide actors towards virtuous behaviour.

## Conclusion

These seminars showed that a resilient society is built through a holistic approach and that it is essential to act at the scale of a relevant territory, not to limit oneself to the "Risks" component but also to involve vulnerability, thus advocating a profound transformation of practices and collaboration between actors,

In parallel with these seminars, the citizen survey carried out by the AFPCNT (sample of 25000 citizens) highlighted the willingness of citizens to invest in resilience approaches, highlighting in particular the need for concrete examples, appropriate training and participation in preventive work to reduce vulnerability.

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## Considerations for the management of large-cap industrial assets.



*Antonio Sola*  
*ESReDA*  
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*President*

From the very beginning of industrial activity, the industrial processes that sustain it have required an operational activity dedicated to the optimized management of technical and organizational resources to correct deviations caused by breakdowns and, more recently, preventing and predicting such breakdowns with the aim of guaranteeing availability, reliability and the efficient and effective use of these, within a framework of compliance with environmental standards and criteria, quality, and safety.

On the other hand, due to the turbulence in the economic environment and the need to adapt production systems to the demands and demands of the markets and the different interest groups, there is an intense competitive pressure that has led companies to constantly seek excellence in their industrial processes. To this end, companies strive to study and analyze in detail the potential that each of the key processes they carry out can contribute to turn them into competitive advantages that facilitate the achievement of their objectives.

Companies with a high capitalization in physical assets, to achieve their objectives, require high availability of these assets, which makes their management a key function of their activity to achieve maximum efficiency.

The arrival in the last decade of the so-called information and knowledge society, understood as one that has a growing technological capacity to store more and more information, circulate it faster and with greater capacity for dissemination while maintaining a capacity for critical and selective appropriation of this information by users who know what they need and what they want and therefore that they can and must dispense with, (Drucker, 1998), and due to the liberalization initiatives of countries, it has facilitated competition, making companies face increasing challenges to improve, in a sustainable way, the developments and processes of their activity.

This increase in competition is supported by the high capacity of information processing, where the designs of high-powered applications go beyond mere business frontiers. It leads companies to a continuous struggle in the search for a balance between reducing costs and increasing productivity and safety, with a better quality of production or service to improve customer satisfaction.

That is why companies with a high capitalization in physical assets must put their effort and effort into establishing models and processes that respond to their business strategies, seeking to ensure that the incidents that affect the profitability of the businesses and their sustainability are controlled throughout their life cycle.

Ever-increasing operational safety requirements to ensure the sustainability of companies are forcing them to rethink their maintenance strategies. The need to exercise greater management control over the activities carried out on assets, using more powerful decision support tools, in a rapidly changing business context, leads to what is known as "asset management". The competitive advantages provided by the proper management of these assets are evident in organizations. Linking asset management to business risk and not just to the cost of maintaining it ends up being a real opportunity for improvement for companies, which go beyond the traditional short-term perspective in management, and end up understanding the true value that assets represent for the business.

Therefore, in organizations, the management of physical assets is aimed at reducing restrictions to achieve the common goal together with the rest of the business assets (human, financial, intangible and information), of achieving the success of the company and consequently of the business.

This common goal is based on the quality of the processes used and on the acceptance of the products developed within a context of "Operational Excellence", understood as the search for the execution of activities in the best possible way, using the best practices and known tools, such as reengineering and process management. the incorporation of information and communication technologies at the operational level, total quality, etc.

It is obvious that, in the markets, as is quite often the case in sectors with a high capitalization in physical assets, it is difficult to find competitive advantages, which makes operational excellence practically the last possibility left for companies to gain competitiveness.

The strategic principles of asset management should seek to ensure that the organization aligns and adjusts resources to meet the needs of customers, in a competitive environment, and to maximize returns for its different stakeholders. In this way, the asset manager becomes the custodian of the organization's main resources, aligning the objectives of its management with the objectives of the business, creating long-term value for the different stakeholders. In most organizations, this translates into maintaining shareholder value, although this purely financial objective can produce imbalances, if other non-financial objectives are not considered, which can influence the results.

In any case, as can be seen, management goals and objectives are the result of interactions and consensus among the various stakeholders. Although the final objectives may not include the interests and desires of all parties, they must reflect the interests of a wide range of parties.

According to Kaplan & Norton (2004), to create value, organizations can establish two types of strategies:

- Productivity strategy, improving cost structure and increasing asset utilization.
- Growth strategy, improving opportunities to increase revenue or increase customer value.

All organizations, regardless of the type of business they develop, must consider some of these strategies to increase their performance, which means that the assets provided by the organization must be seen as an integrated business resource, which needs to be managed. In this way, the objectives of asset management must be compatible with the objectives of the business, that is, the assets must generate

income and meet the needs of the company, but they must do so without compromising their sustainability or future competitiveness.

The benefits and improvements brought by asset management, with an integrated focus on achieving value throughout the asset lifecycle, are well proven in industry and business environments, improving quality of life by contributing to safety, health of people and environmental protection while demonstrating the organization's commitment to quality. performance or safety and helping to mitigate legal, social, and environmental risks associated with accidents in industrial facilities.

#### **About the author**

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## **To fish or not to fish, that is no question**



*Dr. John Stoop*

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*By John Stoop, KINDUNOS Safety, the Netherlands.*

About 100 years ago, the Dutch fishing community was forced to migrate from the inland Southern Sea to the North Sea for reasons of water management and land preservation. This transition was successfully accompanied by innovations of a craftsmanship-based entrepreneurship towards an industrial business model. Nowadays, the Dutch fishing community again is compelled to adapt to a multifunctional use of the North Sea and EU regulations with respect to Green, Sustainable Developments and Climate Change restrictions.

Over the past 40 years, a plethora of innovative developments was initiated, shifting from vessel modifications and component innovations towards an integral approach of sustainable fishing processes, policy making developments and circular economy demands.

Throughout this development, a paradigm-shift in engineering design processes emerged as a necessary condition to enable such a transition. In order to anticipate this paradigm shift, a joint PhD project was initiated at TU Delft and Wageningen University on the sustainability of the fishing process engineering design methodology. This PhD is about to finalize on June 7th at Wageningen University. Three specific case studies highlighted the gradual expansion of the design scope and performance envelope:

- Beamer 2000 vessel design, data driven by safety, health and environment requirements,
- MDV-1 vessel design, driven by people, profit and planet performance indicators,
- MDV-CE, system design, driven by the Triple Zero value chain requirements Zero emissions, Zero waste and Zero accidents.

The first vessel was of a derivative, single aspect driven sustainable design nature, focusing on the prevention of occupational accidents and technical design solutions on single working stations aboard beamers. This design did not yet incorporate end-of-life residual values or return on investment considerations.

The second vessel was of a disruptive nature, incorporating multiple sustainability demands for vessels and fishing gear, was business driven and Triple P sustainable. In order to facilitate subsystem optimizations this design concept introduced principal innovation pillars in the design, ordered along lines of primary functions onboard. Although this concept won the design prize of the Most Innovative Vessel of the year 2016, it turned to be still too static and reactive to anticipate on the new Horizon 2050 demands, labelling the vessel as a design with a promising past.

The MDV-CE finally made the transition from vessel design towards an integral system design. This characterized the design as prospective, incorporating a circular design philosophy with respect to Circular Food Chain and Value Chain on the long term. A new concept of Triple Zero succeeded the Triple P concept by introducing a circular design approach. This approach introduced a future proof concept and dynamic involvement of the fishing community in the design and development process. To this purpose several new design tools were developed, such as the CEDI solution matrix, the introduction of a maritime architect and system integrator and climate adaptive Blue Economy transitions. To facilitate transparency and control at a systems level, Cyclic Innovation Modelling (CIM) and the ESReDA Cube were applied, based on most recent engineering design theories.



In short: sea food also provides food for thought, anticipating new developments by creating a new system engineering design methodology for next generations: the Generative System Engineering Design Process.



*The Ultimate Generative System Engineering Design Process.*

*(through the courtesy of John Stoop)*

## Forthcoming ESReDA Seminars

### The 64<sup>th</sup> ESReDA Seminar



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### 64<sup>th</sup> ESReDA Seminar on

#### Digital Maintenance in the Digital Twin Era.

30-31 May 2024, Universidad de Deusto, Bilbao – Spain.

**Digital Twins (DT) technology** has become indispensable for understanding and deciphering the utility of current developments, unlocking the potential of digital transformation.

It operates like the keystone in an arch, seamlessly bringing together diverse elements of digital technologies and modeling techniques. This synergy creates a unified structural entity, crucial in the emergence of new and complex System of Systems (SoS) structures.



One of the most significant areas where this transformation is expected to make waves is **Digital Maintenance**. Analyzing how maintenance can benefit from this evolution is essential. The advent of new technologies has made the maintenance landscape more intricate, requiring efficient management of vast information and predictive alarms within dynamic schedules.

However, the complexity of the maintenance management process often hampers the technology's impact on organizations. Conventional maintenance practices persist, causing delays in embracing digitalization and hindering the expected return on investment for companies undergoing the digital transformation effort.

Furthermore, **the role of individuals in the context of maintenance digitalization** is critical. Embracing digital transformation offers an opportunity for human evolution, leveraging the expertise and experience of employees in the new digital environment. This provides a competitive edge in driving innovation and technological progress.

Join us at the 64th ESReDA seminar, where researchers, practitioners, and experts from various disciplines converge to share insights and advancements in the realm of digital maintenance and its relationship with digital twins, complex systems, and human resources. Topics include, but are not limited to; the following :

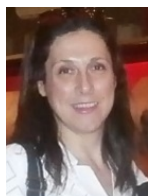
1. Advancements of Digital Twins in Complex Systems Generation.
2. Current Barriers in Implementing Technologies for Real Maintenance Evolution.
3. The Role of Human Resources in the Context of Digital Maintenance and Digital Twins.

**Bilbao, Spain**, will host the 64th ESReDA Seminar on **May 30th and 31st, 2024**. Nestled along the Nervión River, Bilbao seamlessly blends rich history with cutting-edge architecture, epitomized by the iconic Guggenheim Museum designed by Frank Gehry. Participants will have the chance to immerse themselves in the lively Old Town, savor exquisite Basque cuisine, and explore a city that exudes charm at every turn. Join us for an event that marries knowledge exchange with the cool vibe of Bilbao.

We look forward to welcoming you to this unforgettable experience!

The 64<sup>th</sup> ESReDA Seminar program will soon be available on [www.esreda.org](http://www.esreda.org)

## The 65<sup>th</sup> ESReDA Seminar



Dr. Myrto Konstantinidou  
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### 65<sup>th</sup> ESREDA Seminar

**From risk imagination to safety intervention - Managing risks with knowledge, November 2024, National Center for Scientific Research “Demokritos”, Athens, Greece**

ESReDA’s “Risk, Knowledge, Management” (RKM) project group (PG) addresses the intricate relationships between risk, knowledge and management, aiming to find new ideas for preventing accidents and improving safety management with better utilization of knowledge. The RKM PG wishes to organize the 65th ESReDA seminar to foster an exchange of ideas and experts’ debates. The NCSR Demokritos in Athens will provide the forum.

The 65th ESReDA Seminar follows the successful 58th ESReDA Seminar on “Using Knowledge to Manage Risks and Threats: Practices and Challenges”, organized by JRC Institute of Energy (Petten, the Netherlands) and held virtually in June 2021 during Covid-19 pandemic.

Though we are told we live and work in “information and knowledge” society, preventing accidents and enhancing resilience, through the use of relevant safety knowledge and expertise is not granted and requires continuous efforts to overcome the hurdles in an “age of uncertainty”.

The main objective of this forthcoming seminar is to identify the enablers and barriers to the production of knowledge concerning safety risks and resilience and to its effective use in decision-making and other management and operational activities. The key problematic question we will ask is: “What do a management team, a regulator and a front-line worker need to know and is able to use to manage risks effectively?”.

The call for papers is available on ESReDA website following link:

[https://www.esreda.org/event/65th-esreda-seminar-november-14th-15th-2024-ncsr-demokritos-athens-greece/?instance\\_id=62](https://www.esreda.org/event/65th-esreda-seminar-november-14th-15th-2024-ncsr-demokritos-athens-greece/?instance_id=62)

## Past ESReDA Seminars

### The 63<sup>rd</sup> ESReDA Seminar

*Chairwoman*

*Kristine VLAGSMA  
(European Commission,  
Joint Research Centre)*

**Resilience assessment: Methodological challenges and applications to critical infrastructures 25-26 October 2023, JRC, Ispra – Italy.**

Research in resilience of infrastructure systems has been constantly increasing during the last decade and is expected to grow further. Resilience applications in technical systems domain have evolved most significantly during the last two decades and the term resilience has already been transferred to the policy domain, as the Directive on the Resilience of Critical Entities (CER Directive) went into force in January 2023 and replaced the Critical Infrastructure Directive, published in 2008.





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Two fundamental points in resilience domain to be addressed by the Seminar are:

- The methodological development of resilience assessment from a conceptual framework to modelling approaches.
- The metrics for resilience assessment and development of quantitative tools for decision making.



The 63rd ESReDA seminar explored these points and other related

questions. We discussed theories, concepts, and experiences of resilience assessment methodologies and applications. Authors were invited to present their proposals and discuss successes and/or failures and to identify future needs in resilience research. We wanted to encourage new ideas, scientific papers, conceptual papers, case studies and cross-sectoral research on this topic with examples and applications of infrastructures exposed to both technological and natural threats, hazards. The seminar brought together some 50 researchers, practitioners, and decision-makers. While some 25 papers and invited keynotes were presented.



**The proceedings will be soon available for free downloading on the EC JRC Docs site.**



## The 62nd ESReDA Seminar



Alberto Martinetti  
University of Twente,  
the Netherlands

**The 62<sup>nd</sup> ESReDA Seminar on Managing the unexpected: designing systems to embrace disorder for increasing asset reliability**

**April 12th – 13rd, 2023, University of Twente, the Netherlands [62nd ESReDA Seminar](#)**

Dealing with complex systems has certain characteristics that require consideration to be managed successfully. Understanding and dealing with unexpected events and the unknown are major challenge in asset management.

Unexpected drifts from normal working conditions pose several concerns about the decrease in safety levels as well. Despite the enormous changes and developments in the industry in the last decades as ‘an unprecedented fusion between and across digital, physical, and biological technologies’, approaches for guaranteeing comparable safety and reliability improvement do not evolve quickly enough to offer adequate solutions in managing the mentioned complexity.

Complex assets require a different approach to dealing with unpredictable events and disorder. Consequently, it appears necessary, during the design phase of a complex system, to use tools and techniques for both withstanding stress and becoming stronger but without the necessity of predicting every circumstance. Reliability professionals are in need for ‘antifragile’ methods for embracing disruptive situations and unknowns.

The seminar was attended by more than 20 experts from academia and industry. They discussed the application of concepts, the state of the art and current developments in contingency management in complex systems, as well as new techniques and methodologies and their strengths, weaknesses and uncertainties to improve reliability.





## ESReDA members' running projects

### Medelia Chair: Probabilistic fatigue analysis of steel structures



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The ageing of structures in France and around the world means that plant managers have to choose between several scenarios: extending their service life on an unchanged basis, repairs, reinforcements, or even complete replacement. The financial stakes are often very high, given manufacturing and construction costs, as well as operating losses during shutdowns. As a result, plant managers need as much information as possible to assess the residual service life and level of risk associated with each of the above scenarios.

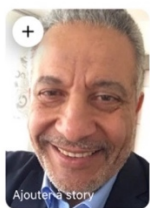
In this context, the Medelia Chair, sponsored by SPRETEC [1] (Artelia Group [2]), created by Fondation Grenoble INP [3], aims to improve the safety and durability of hydraulic structures. It will focus on the study of steel welded connections in non-standard engineering structures such as hydroelectric power plants and dams. The Chair's researchers will be working on new fatigue calculation methods to improve models for predicting the service life of structures. This work will enable more accurate estimates of damage and service life, helping managers to make informed decisions.

Julien Baroth, associate Pr at Grenoble-Alpes Univ., co-hoder of this chair, has recently presented it during the 63th ESReDA seminar in Ispra ; he will contribute to the project group « Resilience Assessment of Critical Infrastructure ».

A thesis began in November, directed by Julien Baroth , 3SR [4], and Rafael Estevez , SIMAP [5], same university, with doctoral student Kamal Harb, entitled "Probabilistic fatigue analysis of mechanically-welded steel structures".



- [1] <https://www.spretec.fr/>
- [2] <https://www.arteliagroup.com/>
- [3] <https://fondation-grenoble-inp.fr/en/>
- [4] <https://3sr.univ-grenoble-alpes.fr/en/3sr-lab>
- [5] <https://simap.grenoble-inp.fr/en/about-simap>



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### Horizon EU Project: BAG-INTEL

With the substantial growth of the volume of air passengers and limited human resources available, the border and customs authorities at inland border airports see the need for new tools, which will increase the effectiveness and efficiency of baggage customs controls without the need to increase the total number of human resources involved in the process.

BAG-INTEL is a Horizon Europe project established to address this challenge. Over the course of the project, our international consortium will bring together all their expertise to develop robust AI-based information processing and decision-making support tools that will help the border and customs authorities at inland border airports in performing their duties.

The 1<sup>st</sup> Newsletter is available at the following link:

<https://preview.mailerlite.io/preview/722703/emails/112712910042563859>

#### BAG-INTEL

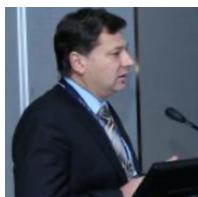
Type of action: HORIZON-RIA

Call: HORIZON-CL3-2022-BM-01

Topic: HORIZON-CL3-2022-BM-01-04

Grant Agreement No.: 101096649

<https://www.bag-intel.eu/>



Vytis Kopustinskas  
ESReDA PG Leader

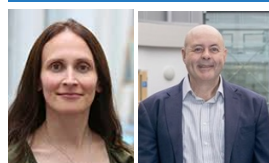
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### ESReDA Project group on Resilience Assessment of Critical Infrastructure

The ESReDA project group on Resilience Assessment of Critical Infrastructure, active since June 2023, has organised two special sessions at the ESREL 2024 conference, held in Cracow, June 23-27, 2024. The special sessions are focused on resilience assessment in electricity sector (session 1) and critical infrastructures in general (session 2). The eight papers submitted are authored by the ESReDA members: JRC, University of Nottingham, Kaunas University of Technology & 'Horia Hulubei' National Institute of Physics and Nuclear Engineering (the latter two applied for ESReDA membership in 2023) and ESReDA partners: University College Dublin, German Aerospace Centre, ETH Zurich.

**See annex (1)** for the details of each of the two special sessions at the ESREL 2024 conference, held in Cracow, June 23-27, 2024.



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University of Nottingham,  
UK

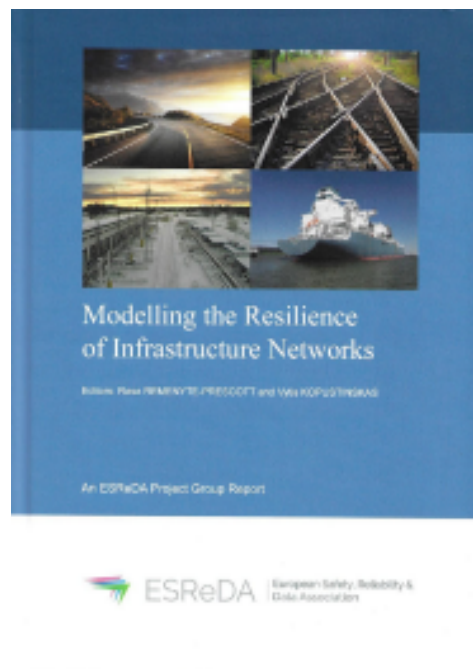
### ESReDA Project group on Resilience Engineering and Modelling of Networked Infrastructure

Findings from the project group have been published in a book entitled "Modelling the Resilience of Infrastructure Networks", edited by Rasa Remenyte-Prescott and Vytis Kopustinskas.

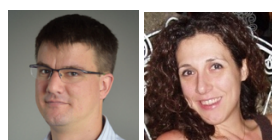
This book is a selection of contributions written by members of the Project Group and concentrates on the themes of transportation and utilities. The papers intend to provide an insight into the state of the art of resilience modelling with a focus on Networked systems. The book is aimed at both an industrial and academic readership with interests in the resilience of engineering systems.

We would like to thank the authors for their contributions to this publication, and our colleagues at DNV for their practical support with printing and distribution.

For information on how to purchase a copy please contact [ajguillen@us.es](mailto:ajguillen@us.es) ESReDA General Secretary, Antonio J. Guillén (Ingeman, Spain).



**Book Purchase Order is joint to the newsletter**



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### ESReDA RKM project group: Risk, Knowledge, and Management

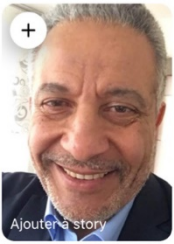
The Risk Knowledge and Management Group is continuing its activities. During the last group meeting on the 22<sup>nd</sup> of February 2023 there was a shift-over of the Group Leader from Eric Marsden to Myrto Konstantinidou and an updating on the status of the discussion papers.

Currently, we have 14 discussion papers under preparation and another 6 under discussion. One is ready to be published in June 2023 and the rest will be published eventually until February 2024. The first one is entitled "Delegation of safety oversight" and it has been prepared by Eric Marsden. We are also planning to host a workshop and ESReDA Seminar in 2024, probably in Athens.

Delegation of safety oversight is a discussion paper on Risk, Knowledge and Management (RKM). It aims to share information on ongoing work undertaken in the context of the RKM project group.

It is actually available for downloading [here](#).

## ESReDA community recommended books



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Senior Expert  
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INSA (France)

### **From Risk to Resilience: Towards Sustainable Development for All in a COVID-19 Transformed World**

***Global Platform for Disaster Risk Reduction- UN DRR  
Proceedings of the Seventh Session, Bali, Indonesia, 23-28 May 2022***

The Seventh Session of the Global Platform for Disaster Risk Reduction (GP2022) was a decisive moment for re-thinking our approach to managing risk. It was the first such gathering since the beginning of the COVID-19 pandemic and, despite the challenges, the Global Platform, which took place in a hybrid format, saw a record level of participation, with 5,000 participants from a total of 185 countries. It was also the most inclusive and accessible Global Platform to date, with over 200 persons with disabilities participating in person.

The outcomes of the Global Platform are captured in The Bali Agenda for Resilience. Its seven recommendations call to first, reconfiguring risk governance to ensure that management of risk is a shared responsibility across sectors. Second, funding for disaster risk reduction to be written into laws and included in integrated national financing frameworks. Third, it calls upon governments to honour the COP26 Glasgow commitments to drastically enhance financing for adaptation and resilience. Fourth, it calls for empowering those most at risk under the motto of “nothing about us without us”. Fifth, it expresses support for the call by the United Nations Secretary-General that early-warning systems cover every person on Earth within five years. Sixth, that the world applies the lessons of the pandemic to build back better, greener, and equitable. Seventh, that all Member States, regional organizations, and stakeholders robustly engage in the Midterm Review of the implementation of the Sendai Framework.

*(extracted from the introduction of Mme Mami Mizutori, Special Representative of the UN Secretary-General for Disaster Risk Reduction)*

Proceedings are available for downloading at:

[file:///C:/Users/mimi/Desktop/EU\\_NCP-SMIIG/Global%20Platform%202022%20Proceedings\\_DIGITAL\\_1.pdf](file:///C:/Users/mimi/Desktop/EU_NCP-SMIIG/Global%20Platform%202022%20Proceedings_DIGITAL_1.pdf)



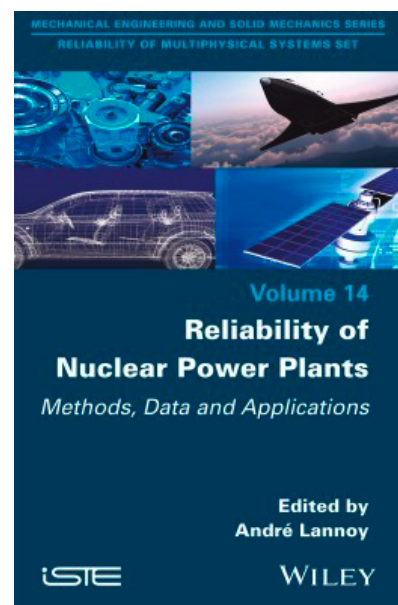
ESReDA Honorary  
President  
Jean-François Raffoux

### **Reliability of Nuclear Power Plants Methods, Data and Applications**

***Abdelkhalak El Hami***

Since the 1970s, the field of industrial reliability has evolved significantly, in part due to the design and early operation of the first-generation nuclear power plants. Indeed, the needs of this sector have led to the development of specific and innovative reliability methods, which have since been taken up and adapted by other industrial sectors, leading to the development of the management of uncertainties and Health and Usage Monitoring Systems.

In this industry, reliability assessment approaches have matured. There are now methods, data, and tools available that can be used with confidence for many industrial applications. The purpose of this book is to present and illustrate them with real study cases. The book addresses the evolution of reliability methods, experience feedback and expertise (as data is essential for estimating reliability), the reliability of socio-technical systems and probabilistic safety assessments, the structural reliability and probabilistic models in mechanics, the reliability of equipment and the impact of maintenance



on their behavior, human and organizational factors, and the impact of big data on reliability. Finally, some R&D perspectives that can be developed in the future are presented.

Written by several engineers, statisticians and human and organizational factors specialists in the nuclear sector, this book is intended for all those who are faced with a reliability assessment of their installations or equipment: decision-makers, engineers, designers, operation or maintenance engineers, project managers, human and organizational factors specialists, experts and regulatory authority inspectors, teachers, researchers, and doctoral students.

The book can be ordered [here](#).



Pierre Dersin

*Consultant en System  
Safety, Reliability, and  
Maintenance  
Modelisation &  
Analysis*

## **Modeling Remaining Useful Life Dynamics in Reliability Engineering,**

**CRC Press, June 2023.**

**Pierre Dersin**

This book applies traditional reliability engineering methods to prognostics and health management, and specifically Remaining Useful Life (RUL) dynamics.

In the context of the digital transformation, the last two decades have witnessed a significant evolution in the theory and practice of industrial maintenance : information and communication technologies now make it possible to replace traditional maintenance ( i.e. scheduled preventive and corrective ) with predictive maintenance, based on estimation and prediction of individual asset state of health.

To that end, an invaluable decision support tool is the estimation of asset remaining useful life (RUL). RUL is a function of time ; it is also stochastic since it is affected by observation errors, variability of environmental conditions and mission profiles, and imperfect knowledge of degradation mechanisms . Taking that uncertainty into account is essential for sound risk management . Failing to do so will generally lead to inappropriate maintenance decisions.

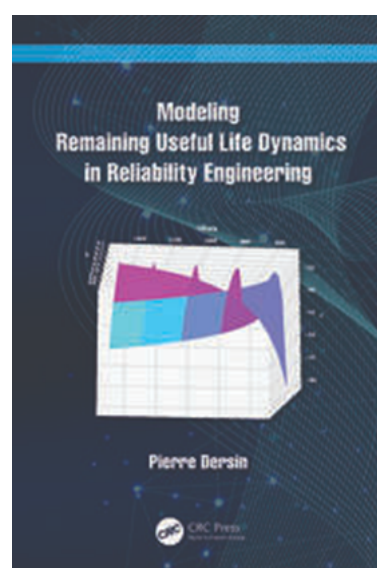
Methods used to estimate RUL are numerous and diverse and, broadly speaking, fall into three categories: model-based, data-driven, and hybrid. The author starts by building on established theory and looks at traditional reliability engineering methods through their relation to Prognostics & Health Management (PHM) requirements and presents the concept of RUL loss rate. Following on from this, the author presents an innovative general method for defining a nonlinear transformation enabling the mean residual life (MRL) to become a linear function of time, which leads to explicit analytical results, for instance for RUL confidence intervals and RUL probability distribution.

He applies this method to frequently encountered time-to-failure distributions, such as Weibull, gamma and lognormal, and first-hitting times of stochastic processes such as the Wiener or gamma process, used to model degradations . Latest research results, including the author's (some of which were previously unpublished), are drawn upon and combined with very classical work. A complete chapter is devoted to the examination of the properties of the time transformation that allows for the linearization of the MRL. Statistical estimation techniques are then presented to estimate RUL from field data

Finally the use the results for maintenance support and in particular predictive maintenance, is discussed. A risk-based method for predictive maintenance optimization is presented.

The book ends with suggestions for future research, including links with machine learning.

Industrial applications are described and every chapter is followed by a series of exercises.





The book is of interest to engineers, researchers and students in reliability engineering, prognostics and health management, and maintenance management.

<https://www.taylorfrancis.com/books/mono/10.1201/9781003250685/modeling-remaining-useful-life-dynamics-reliability-engineering-pierre-dersin>

## Forthcoming Conferences & Seminars



### 24th Lambda-Mu congress 14 to 17th October 2024, Bourges (France)

#### ***Risk-related professions : keys to reindustrialisation and ecological transition.***

Every two years, the French scientific organisation IMDR (Institute for risk mastering and dependability) organizes the lambda-mu congress, which brings together 300 to 400 participants; They represent the different industrial sectors and the various risk professions inside organizations and their stakeholders.

The 24th edition of the congress will be held in Bourges from 14 to 17 October 2024.

In the context of the issues related to climate change and the geopolitical situation, the congress invites representatives of the various risk professions to come and share their experiences, knowledge and skills to contribute to meet the challenge of reindustrialization and ecological transition.

For more information, visit the congress website: [www.imdr-lambdamu.eu](http://www.imdr-lambdamu.eu)

Papers are written and presented in French or in English



### Sustainable and Digital Innovation in Engineering Asset Management. July 3 - 5, 2024, Lisbon, Portugal



CONGREGA 2024 seeks to push the boundaries of SUSTAINABLE AND DIGITAL INNOVATION in Lusophone (Portuguese-speaking) and Hispanic (Spanish-speaking) countries and communities spread across Europe, the Americas, Africa, Asia and Oceania.

It is expected to gather over 300 delegates to share state-of-the-art knowledge in research and applications of advanced management and digital and deep-tech solutions enabling excellence in ENGINEERING ASSET MANAGEMENT.

<https://congrega.eu>

## BEMAS Formation

Maximisez vos compétences en gestion de la maintenance - Découvrez nos trois formations uniques !



### BEMAS - Belgian Maintenance Association vzw-asbl

For details: <https://www.bemas.org/en/trainings>

ESReDA Members, you are kindly invited to contribute to the ESReDA newsletter sharing news, announcement of events, your experiences, ideas, etc. You are supposed to elaborate proposals to create new Project Groups, host ESReDA Seminars or initiate collaborative activities.

ESReDA: European Safety, Reliability & Data Association

Association internationale sans but lucratif, régie par la loi Belge du 27 Juin 1921-Titre III (Registration N°: 0452522618 - Siret:E00005802)

Headquarter: ESReDA, rue Gachard 88 Bte 14, B-1050 Bruxelles, Belgium

Contact ESReDA | [info@esreda.org](mailto:info@esreda.org)